



# The NIH Roadmap

## Presentation to the Interagency Image-Guided Intervention Grantee Workshop

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# Focus Questions

- How and why was the NIH Roadmap developed?
- How is it being implemented?
- What are the initiatives?
- How will the Roadmap benefit my research area?

# The Problem



# Why a Roadmap?

- Accelerated pace of discoveries in the life sciences
- Need for their more rapid translation into practice
- Opportunities to build an integrated system that is far more effective than current approaches

# How was the Roadmap developed?

- Extensive consultations with stakeholders, scientists, health care providers
  - **What are today's scientific challenges?**
  - **What are the roadblocks to progress?**
  - **What do we need to do to overcome roadblocks?**

# Roadmap Chronology

<b>August 2002</b>	<b>Consultation with over 100 thought leaders</b>
<b>September 2002</b>	<b>IC Directors' Leadership Forum</b>
<b>March 2003</b> including	<b>Formation of 15 Working Groups over 300 outside experts</b>
<b>April 2003</b>	<b>Presentation to Council of Public Representatives (COPR)</b>
<b>May 2003</b>	<b>Working Groups propose initiatives</b>
<b>June 2003</b>	<b>IC Directors commit to initiatives</b>
<b>June 2003</b>	<b>Presentation to the Advisory Committee to the Director (ACD)</b>
<b>September 2003</b>	<b>Presentation to advocacy groups, press</b>
<b>FY 2004-2013</b>	<b>Staged implementation</b>

# Criteria for Roadmap Initiatives

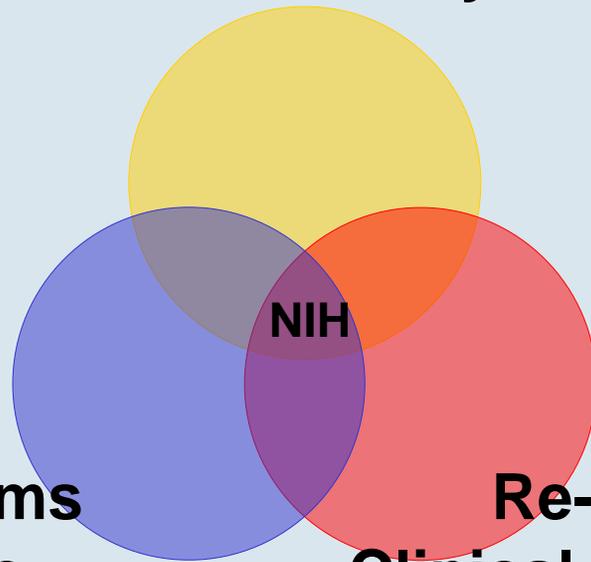
- Is it 'transforming' -- will it change how or what biomedical research is conducted in the next decades?
- Would its outcome enhance the ability of all ICs to achieve their own missions?
- Can the NIH afford to NOT attempt it?
- Will it be compelling to our stakeholders, especially the public?
- Is it something that no other entity can or will do?

# What is the NIH Roadmap?

- A **framework of priorities** the NIH as a whole must address in order to optimize its entire research portfolio.
- A **vision for a more efficient, innovative and productive system** of biomedical and behavioral research.
- A **set of initiatives that are central to extending the quality of healthy life** for people in this country and around the world.

# NIH Roadmap for Medical Research

**New Pathways  
to Discovery**



**Research Teams  
of the Future**

**Re-engineering the  
Clinical Research Enterprise**

# New Pathways to Discovery

**Bench** ↔ **Bedside** ↔ **Practice**



Building Blocks  
and Pathways  
Molecular Libraries  
and Imaging  
Bioinformatics  
Computational  
Biology  
Nanomedicine

# NIH ROADMAP

<http://nihroadmap.nih.gov>

**NIH Roadmap** ACCELERATING MEDICAL DISCOVERY TO IMPROVE HEALTH

- ▶ [Overview](#)  
Soon after becoming the Director of the National Institutes of Health (NIH), in May 2002, Elias A. Zerhouni, M.D. convened a series of meetings to chart a "roadmap" for medical research in the 21st century. [More...](#)
- ▶ [Press Release](#)
- ▶ [Press Briefing Video](#)
- ▶ [Science Magazine Article](#)
- ▶ [NIH Roadmap Initiatives](#)
- ▶ [Grants and Funding Opportunities](#)

### New Pathways to Discovery

- ▶ [Building Blocks, Biological Pathways, and Networks](#)
- ▶ [Molecular Libraries and Imaging](#)
- ▶ [Structural Biology](#)
- ▶ [Bioinformatics and Computational Biology](#)
- ▶ [Nanomedicine](#)

### Research Teams of the Future

- ▶ [High-Risk Research](#)
- ▶ [Interdisciplinary Research](#)
- ▶ [Public-Private Partnerships](#)

### Re-engineering the Clinical Research Enterprise

- ▶ [Re-engineering the Clinical Research Enterprise](#)

**NIH Roadmap** ACCELERATING MEDICAL DISCOVERY TO IMPROVE HEALTH

▶ [Home Page](#)

## Molecular Libraries and Imaging

### OVERVIEW

A class of organic chemicals, commonly referred to as "small molecules," has proven to be extremely important to researchers exploring the functions of the cell at the molecular level. Such molecules have also been valuable for treating everything from headaches to cancer. In fact, most medicines, from aspirin to antihistamines, are small molecule compounds.

# Molecular Libraries:

## Putting Chemistry To Work for Medicine

- Library representing essentially all of 'chemical space'
- Six national centers for screening activities of small molecules
- Technological advances in combinatorial chemistry, robotics, 'virtual screening'
- Public database

# Molecular Libraries and Imaging

- Analytical and Imaging opportunities
  - ...small organic molecules which can be used as chemical probes to study cellular pathways in greater depth
  - ...detect and treat common and rare diseases by providing early stage compounds that encompass a broad range of **novel targets** and activities
  - ...generate **novel imaging probes** for biomedical research and clinical applications

# Novel reporter molecules

## Optical contrast agents

- Nanocrystals – Quantum dots
- Up-converting crystals
- Organic dyes
- Multi-functional reporters (fluorescence, EPR)

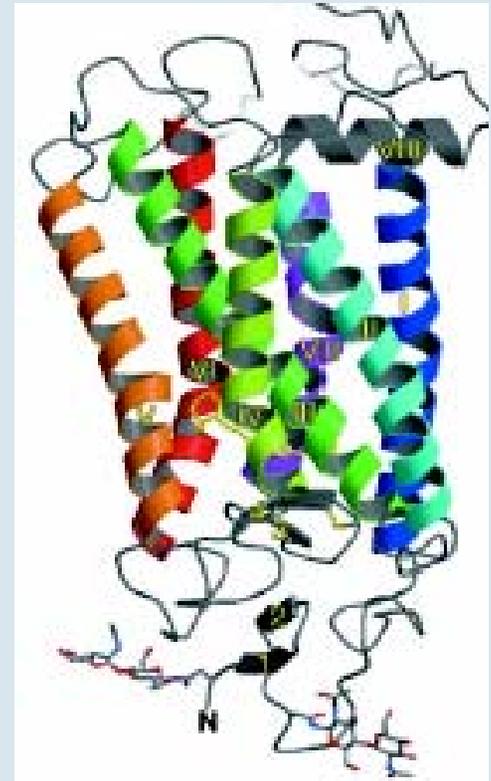
# Novel imaging molecule opportunities

- **In vivo excitation and detection**
- **Photostability and degradation**
- **Toxicity**
- **Labeling for targets**
- **Size**
- **Multi-modality reporters**
- **Spectral purity – excitation and emission**
- **Theoretical models**
- **Real time analysis**
- **Analytical technologies**



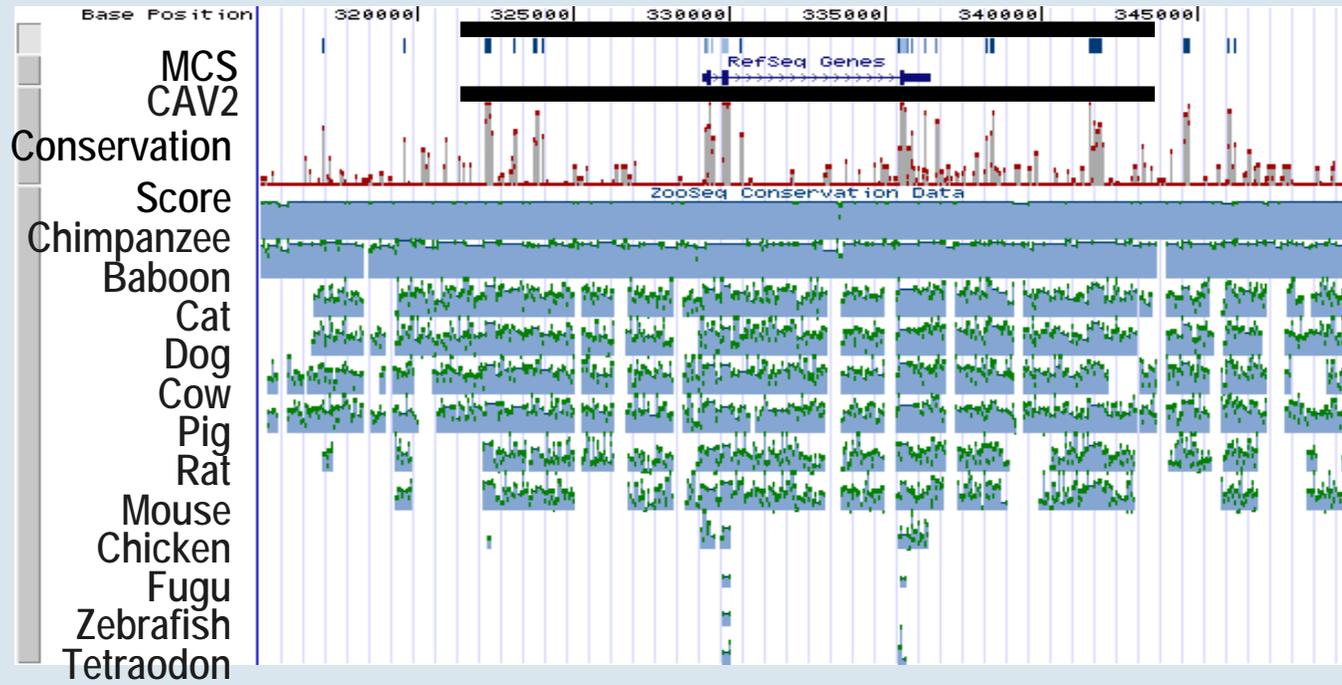
# Structural Biology: Life in Three Dimensions

- **>500** 7 trans-membrane receptors
- **~2%** of human genome
- Targets of **33%** of all therapeutic drugs with sales **>\$500 M/yr**
- ***BUT*** only a small minority of these receptors are currently targeted
- The structure of integral membrane proteins – the next frontier!



# Computational Biology: Modeling the Cell's Information Superhighway

National Centers for Biomedical Computing





# **NIH Roadmap**

## **Research Teams of the Future**

**Scale and complexity of 21<sup>st</sup> C research require new organizational models for scientific teams**

- **Multi-disciplinary and Inter-disciplinary Teams**
- **Larger, coordinated, resource sharing Teams**
- **Preserve the investigator(s)-initiated strategy**

# Multi- and Interdisciplinary Research will be Required to Solve the “Puzzle” of Complex Diseases and Conditions

**Genes**

**Behavior**

**Diet/Nutrition**

**Infectious agents**

**Environment**

**Society**



**“ Biology and Engineering are beginning to cross paths. At their intersection could come remarkable advances in the understanding and treatment of disease.”**

- Gary Taubes, Technology Review , 4/2002

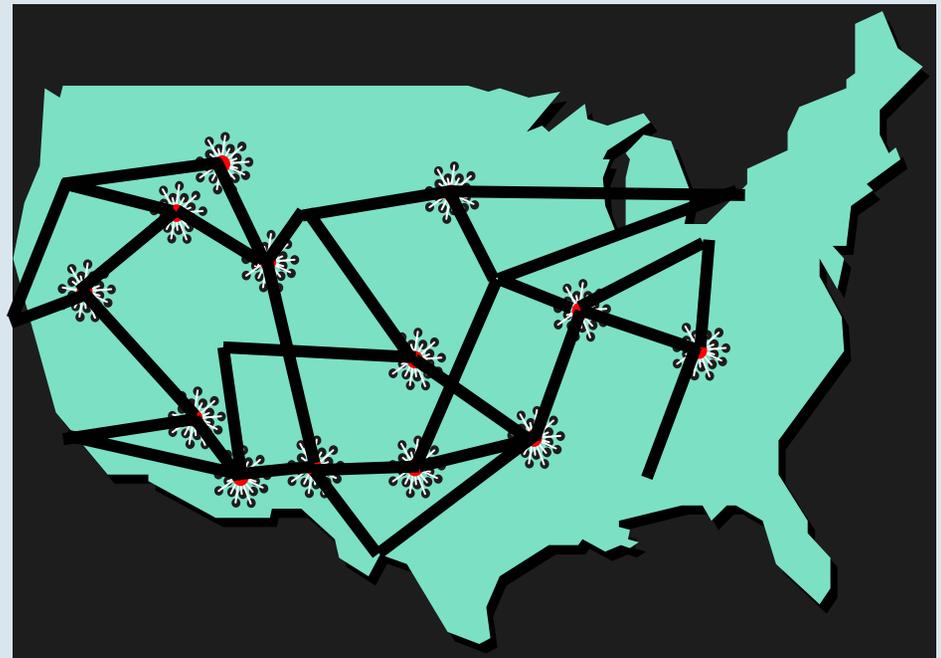


# NIH Director's Pioneer Award

- New program to support individuals with untested ideas that are potentially groundbreaking
- Encourages innovation, risk-taking
- Totally new application and peer review process
- Provides \$500 K/year for 5 years
- Expected to be highly competitive

# Integration of Clinical Research Networks

- Link existing networks so clinical studies and trials can be conducted more effectively
- Ensure that patients, physicians, and scientists form true “Communities of Research”



# Integration of Clinical Research Networks

- Create interoperable 'Network of Networks'
  - National Electronic Clinical Trials/Research Network (**NECTAR**)
  - Common data standards, informatics
  - Software application tools for protocol preparation, IRB management, adverse event reports
- Use existing networks to rapidly address questions beyond their traditional scope

# NIH Roadmap Strategy

Interdisciplinary Research  
Pioneer Award  
Nanomedicine

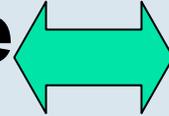
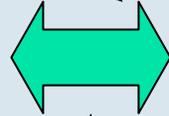
Public Private  
Partnerships

Training  
National Clinical Research  
Associates

**Bench**

**Bedside**

**Practice**

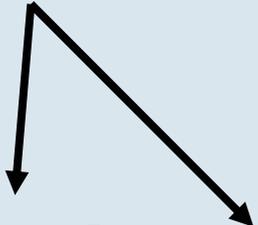
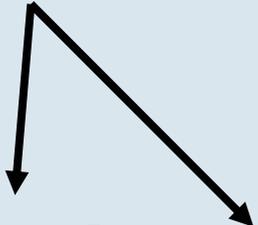


Building Blocks  
Pathways  
Molecular Libraries  
Bioinformatics and  
Computational  
Biology  
Structural Biology  
Nanomedicine

Translational  
Research  
Initiatives

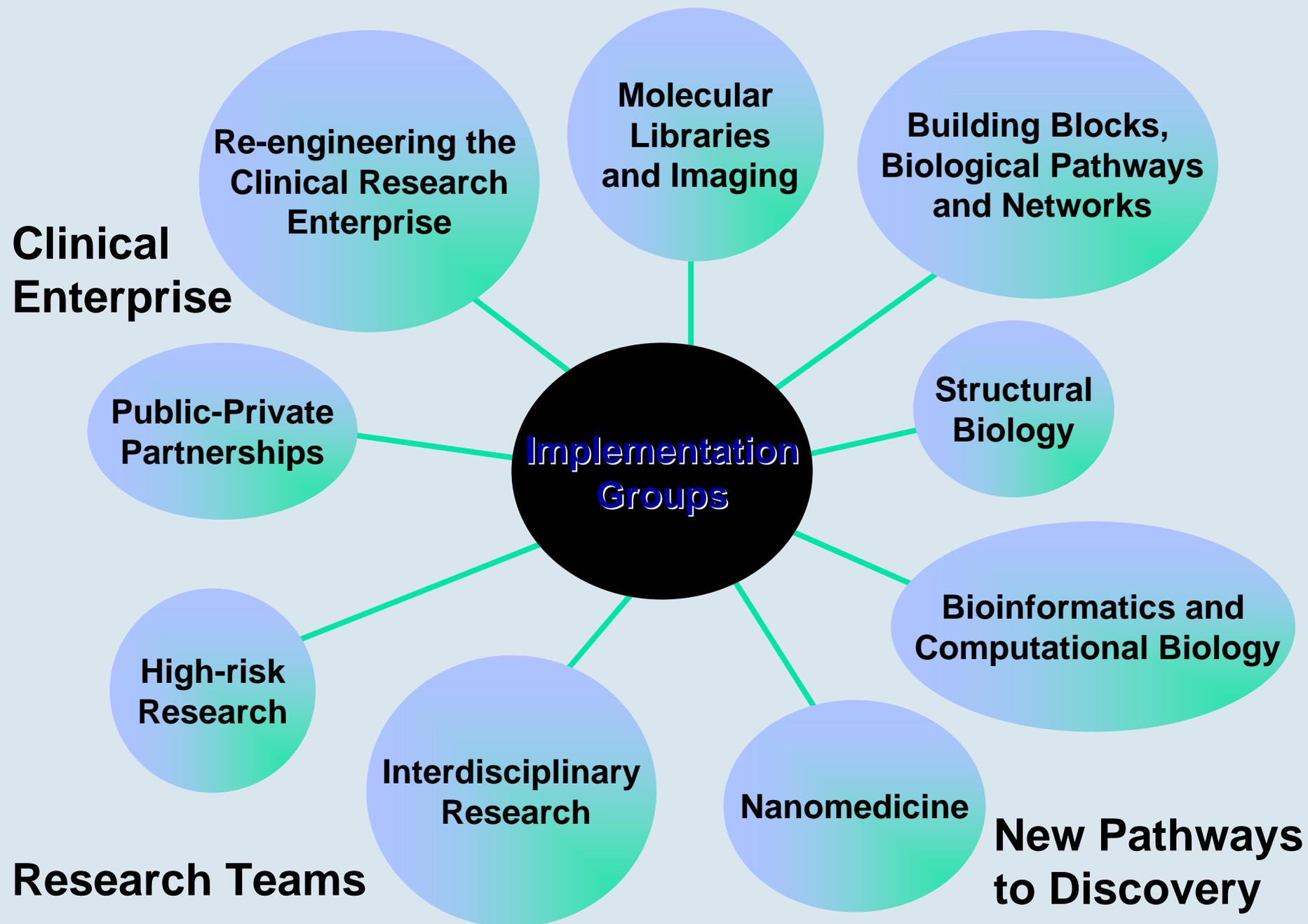
Clinical  
Research  
Informatics

Integrated Research  
Networks  
Clinical outcomes



# Key elements of Roadmap funding and management

- All Institutes:
  - Participate with their scientific community in defining all components of the Roadmap
  - Contribute equally and proportionately
  - Participate directly in decision making and have a direct liaison to the Roadmap
- All Roadmap initiatives are offered for competition to researchers from all fields
- All research communities can compete for all initiatives
- The peer-review process will ensure appropriate expertise



# Roadmap Funding

dollars in millions

**FY 2004 Funding = \$128.3 (dollars in millions)**

**New Pathways  
to Discovery**

**\$64.1**

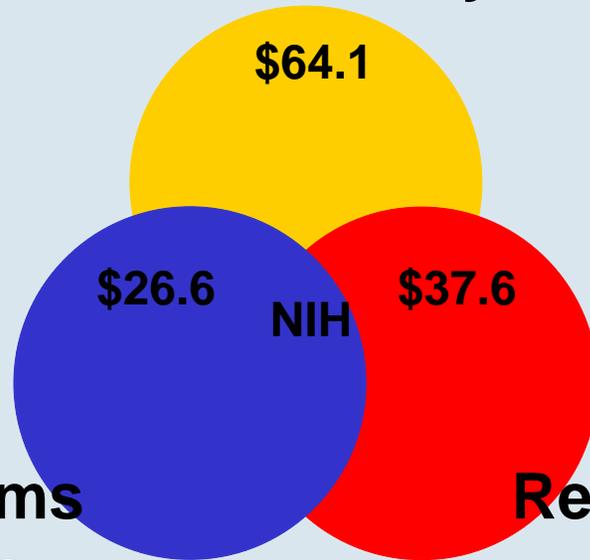
**\$26.6**

**NIH**

**\$37.6**

**Research Teams  
of the Future**

**Re-engineering the Clinical  
Research Enterprise**



# Roadmap Funding

dollars in millions

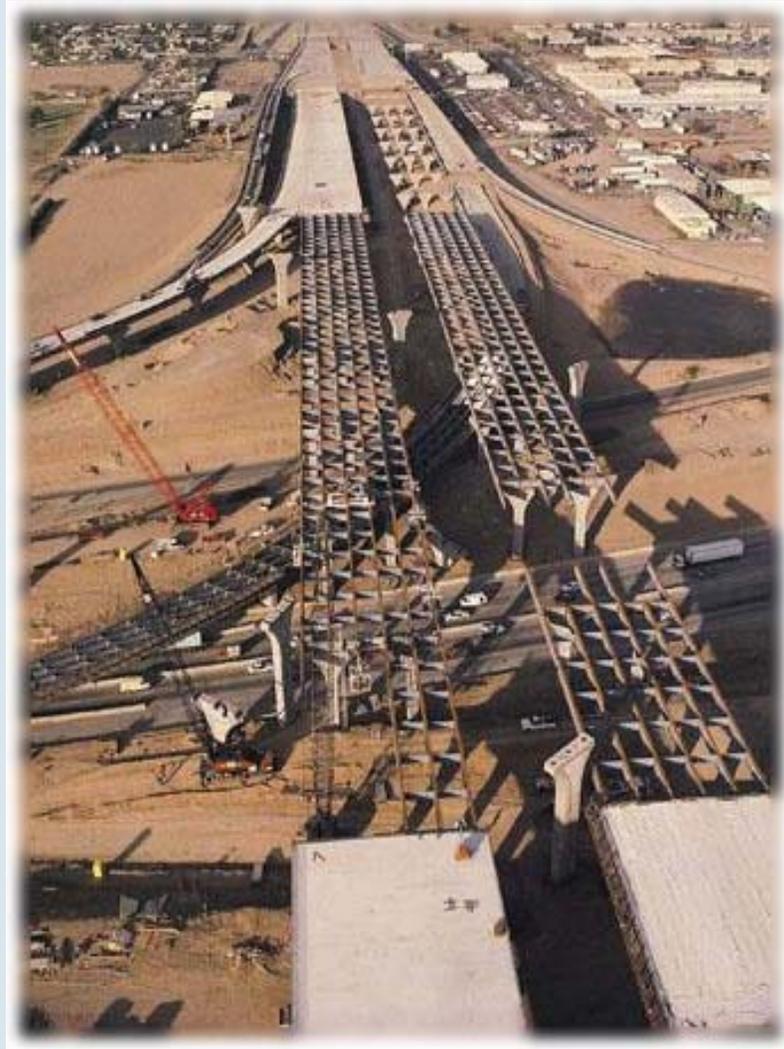
	<b>FY04</b>	<b>FY05</b>	<b>FY06</b>	<b>FY07</b>	<b>FY08</b>	<b>FY09</b>	<b>Total</b>
Pathways to Discovery	<b>64</b>	<b>137</b>	<b>169</b>	<b>182</b>	<b>209</b>	<b>188</b>	<b>948</b>
Research Teams	<b>27</b>	<b>39</b>	<b>44</b>	<b>92</b>	<b>96</b>	<b>93</b>	<b>390</b>
Clinical Research	<b>38</b>	<b>61</b>	<b>120</b>	<b>174</b>	<b>214</b>	<b>227</b>	<b>833</b>
<b>Total</b>	<b>128</b>	<b>237</b>	<b>332</b>	<b>448</b>	<b>520</b>	<b>507</b>	<b>2,172</b>

**0.34% 0.63%**

**~0.9%**

**To be competed for in a common pool  
of initiatives by all researchers from every discipline**

# The Roadmap: *A Work in Progress*





# NIH



Ideas  
People  
Resources

